



Figure 13.4 Deliquoring a filter cake and the effect of cracking.

If a filter cake is not washed but just drained (deliquored), all the product and impurities left in solution in the pendular mother liquor which remains in the cake will be deposited in the cake on drying, potentially leading to a lumpy and impure product. This is illustrated in Figure 13.4 in which the schematic image on the left indicates the passage of air in a laboratory setting or nitrogen in a plant context, through the cake. Once the gas penetrates the cake, bubbles can be seen on the lower surface of the filter medium. This is known as the bubble point, from this point on the rate of drainage of mother liquor from the cake tails off as the majority of the gas flow passes through the open pores rather than actively displacing mother liquor. The plot on the right of the figure indicates the typical fraction of the mother liquor and associated impurities remaining in the cake as the deliquoring progresses.

Three washing strategies are available to address this problem of incomplete removal of mother liquor; displacement washing of a fully saturated filter cake, washing an already deliquored cake, and resuspension washing a deliquored cake.

13.4.1 Displacement Washing

The wash liquid, either a pure solvent or solvent mixture, is forced through the already formed cake with the aim of displacing the mother liquor. Successful displacement washing requires that the wash solvent is applied to the filter cake without disturbing the cake surface. Delivering the wash solvent rapidly onto the saturated cake surface re-suspends product crystals and creates a thin point in the cake making a preferential path through which wash can pass more rapidly than through the remainder of the cake. This form of resuspension also causes the mother liquor held between the re-suspended particles to become mixed throughout the wash solvent